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The Rise and Fall of the Ancient Maya

A Case Study in Political Ecology

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ABSTRACT

The ancient southern lowland Maya of the Yucatán Peninsula provide a case-study example of the complex and ever-changing relationships between humans and their environments from the specific vantage of a fragile biophysical setting that was engineered into a highly resilient and productive landscape. Their semitropical ecosystems, like most landscapes, have been significantly affected by humans both today and in the ancient past. However, the rate and process of ecosystem engineering is different in tropical settings when compared to semi-arid or temperate regions. Because of shallow and frequently poorly drained soils, coupled with a biogeography of species-rich diversity but one associated with a sparse number of any one species within any specific patch, early sedentary adaptations by humans were challenging. Like other members of their biophysical world, humans practiced dispersed living strategies to harvest the environs. This chapter assesses the socioeconomic and sociopolitical potential for sustainability and collapse in a tropical ecosystem given the biophysical constraints. The significant role of self-organization and heterarchical networks are examined in the context of social complexity.

INTRODUCTION

The ancient Maya of karstic lowland Central America occupied a geographic region of 250,000 km^2 with an uninterrupted cultural legacy of at least 1500 years. Although much is made of their well-known, if little understood, collapse in the 9^{th} century A.D. (most recently popularized by Diamond 2005), the long-lived success of the Maya within a difficult and frequently inhospitable semitropical environment warrants greater attention. As a primary civilization, or a highly

complex social order unlike any preceding it, and the only such "state" from a tropical regime, the Maya are best known for their towering pyramids, elaborate ball courts, developed art forms, and a writing system unparalleled elsewhere in the pre-Hispanic Americas. So how is it that a primary civilization without the wheel, sail, metal tools, beasts of burden, or navigable rivers was capable of supporting an estimated 10 million people by A.D. 700 (Rice and Culbert 1990)?

ECOLOGICAL BACKGROUND

The critical data in addressing this multifaceted quandary are a set of interdependencies within and between early Maya communities and the environments they selected to alter (Figure 4.1). Unlike the first great riverine states in the semiarid Old World—Sumeria, Pharaonic Egypt, the Indus, and the ancient Shang/Erlitou—often associated with major canalization efforts, the Maya occupied a wet–dry tropical forest resting on limestone bedrock and associated with limited

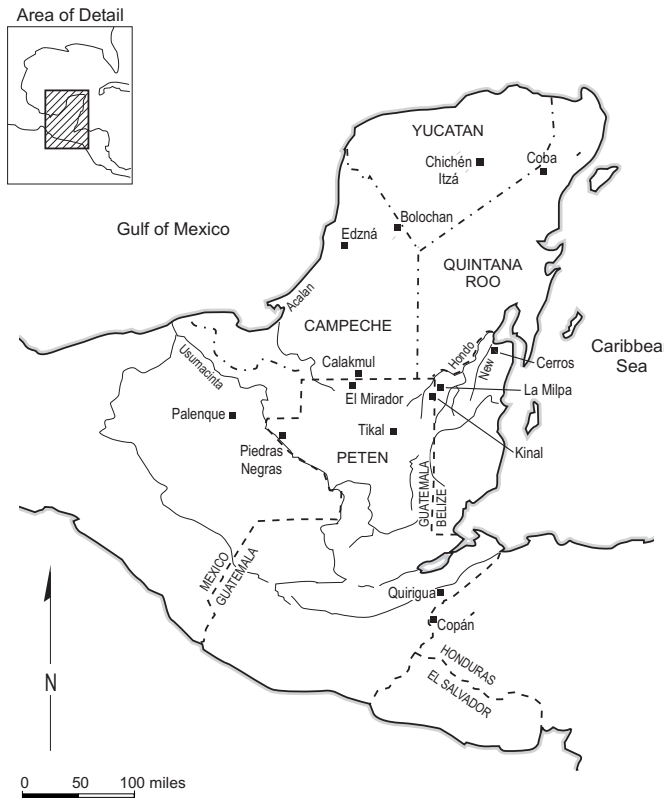

Figure 4.1 Map of the Maya area showing several of the most significant archaeological sites.

surface drainage. Two principal environmental constraints affect our assessment of the ancient Maya. The first is precipitation. Because of the marked seasonality of rainfall, four to six months of the year are drought-like. In the southern Maya Lowlands, the heart of significant cultural development, over 90% of the precipitation falls during the 7–8 month-long rainy season. Because of the pocked and fissured character of the limestone, most surface water rapidly percolates into the karstic substratum, out of reach to a stone-age technology. Although climatic modeling suggests some changes in the timing and duration of seasonal rainfall in the past (Gill 2000; Gunn et al. 1995; Hoddell et al. 1995), the setting is unlikely to have received any more rainfall than it does today.

A second ecological constraint characteristic of many tropical environments is the natural distribution of potential food resources. Although tropical ecosystems are renowned for their tremendous diversity of species when compared to temperate and semiarid settings, they are also noted for a limited number of any one species within any specific microhabitat or patch. For conventional views of complex society based on resource concentrations, stored surpluses, and dense aggregates of people (i.e., towns and cities), the natural environment poses daunting challenges. When coupled with elevated temperatures and humidity, stored surplus foodstuffs are prone to accelerated decomposition when compared to other primary states in semiarid settings.

CULTURE HISTORY

The culture history of the ancient Maya suggests that sedentary pioneer populations migrated from the Archaic Period (7000–2500 B.C.) estuary margins of the western Caribbean and southern Gulf of Mexico coasts into the interior of the Yucatán Peninsula by 1000 B.C., though early highland sedentists subsisting on maize and other domesticates were surely influential (Scarborough 1994). Movement of these populations into the dense lowland vegetation was dependent on water access from shallow internally draining lakes and seasonal swamp-like settings. Evidence suggests that by at least A.D. 1, some of the large seasonal swamps (bajos) now comprising more than a third of the landscape and widely recognized as unusable terrain were perennial lakes (Dunning et al. 2002). By the Late Preclassic Period (400 B.C. to A.D. 250), a large sedentary population had dispersed across the entire Yucatán Peninsula, most positioned in proximity to a present-day bajo or internally draining karstic depression. This population represents the first experiment in state-like complexity and is associated with all the material trappings of subsequent Classic Maya statecraft (A.D. 250–800). In addition to pyramids and ball courts, Late Preclassic communities significantly modified their landscapes to best centralize their water needs. They created "concave microwatersheds" (Scarborough 1993, 1994, 2003a) (Figure 4.2) at the margins of natural karstic sinks (aguadas) or larger depressions (bajos

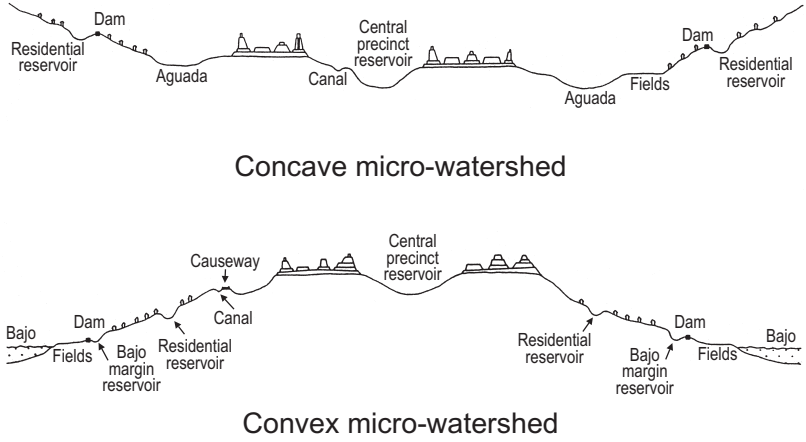

Figure 4.2 Microwatersheds in the Maya area.

or polje) that contained water year around. Their communities were often carefully altered to capture the seasonal rainfall efficiently and channel it to several localities for subsequent use. Although planned and coordinated, the water system was a passive adaptation in that the natural terrain was only modified enough to accommodate the flow of water across the low-lying depression space already present. Nevertheless, some of the largest communities in Maya history were constructed at this temporal juncture (e.g., El Mirador [Hansen et al. 2002; Matheny 1986]) based on a passive concave microwatershed landscape design.

By the Early Classic Period (A.D. 250–550), fundamental landscape changes were underway. Throughout the Maya Lowlands, major centers located/relocated to the summits of hillocks or ridges quarrying limestone to construct their pyramids and huge paved plazas. Like their predecessors, but in a more active manner, these architects reinvented their environs by constructing "convex microwatersheds" (Scarborough 1993, 1994, 2003a) (Figure 4.2). Here, the elevated landscape was quarried as much for the resulting cavities that were rapidly converted into clay-sealed reservoirs as for the building stone to construct pyramids and palace structures. In addition, the carefully planed plaza surfaces were slightly canted to shed seasonal precipitation into these former large quarry scars. Thick layers of plaster were used to cover the natural pocked and pitted limestone surfaces to prevent premature water loss and to promote sizable amounts of runoff into the elevated reservoirs. Following the rainy season, potable water was then released as needed by gravity flow from the summit reservoirs to the densest portion of the population occupying a Classic Period site on the flanking slopes of the hillock. In the case of Tikal, gray water was captured in large swamp-margin tanks used for subsequent agricultural ends after passing through the densest residential zones (Scarborough and Gallopin 1991). The convex microwatershed was a creative and extremely well-designed water

system in a water-stressed environment, but why did the transition from a concave to convex microwatershed system occur?

The cultural transition from the Preclassic to the Classic Period now indicates that the successes of the Late Preclassic towns were based on the intensification of those lake margin settings for agricultural productivity. Raised or ditched fields are well documented at this time along the few perennial rivers in northern Belize (Pohl et al. 1990) and are conjectured within several of the ancient bajos. Moreover, terrace construction is implemented for the first time, suggesting both the necessity for more food to support the successes of a growing population but also to control soil erosion from the deforested slopes leading into the shallow lakes and low-lying communities (Dunning et al. 2002; Hansen et al. 2002). Nevertheless, by the Early Classic Period tons of sediment eroded into the former shallow lakes displacing water sources and disrupting the ancient natural seals holding lake waters. Evidence from climatic modeling further suggests the onset of a serious drying trend which only exacerbated the water deficit (Gill 2000; Gunn et al. 1995; Hoddell et al. 1995). Late Preclassic agricultural overproductivity when coupled with the degraded fragility of the semitropical environment actually stimulated the subsequent Classic Period florescence and a political ecology associated with a centralized and controllable tank system based on the "convex microwatershed."

AN EXPLANATION

There is, however, much more to the story (Scarborough 2003b). Drawing heavily on the scholarship of Lansing (1991), Scarborough et al. (1999), and Crumley (2003), a model is proposed here grounded on the environmental changes noted above but further determined by the interplay between social decision making and the accretional pace at which changes to the landscape occurred. The concept of self-organization is used to examine the semitropical ecology occupied by the ancient Maya and their constant need to monitor and frequently substitute usable plants, soils, and some animals in attempting to mimic the natural pathways and tempos set by the many variable patches harvested. Because the biophysical environments were seldom clearly circumscribed or naturally bounded in a manner identifiable by some other nontropical settings, the ecological backdrop for the Maya was ever-changing. When attempting to make this environment a human-made setting, only slow, incremental modifications were possible without significantly altering existing pathways and disrupting the natural flow of nutrients and energy. Given the fragility of many of the microhabitats in the semitropical setting, rapid landscape change involving monocropping or clear-cutting large jungle tracts could lead to catastrophic environmental degradation and resulting population reorganization and/or relocation. Because of these constraints, the ancient Maya managed their

landscape in a different way than that of several other early civilizations (Scarborough 2000, 2003a). Although more precarious than some other environments (Scarborough 2005), the Maya adapted to their semitropical ecology by dispersing their populations and attempting to replicate its natural tendencies. There were several early efforts to concentrate populations and resources during the Late Preclassic Period (as noted above) in a manner typifying the precipitous rise of several early semiarid states, but they failed. These radical attempts at centralization were initiated too rapidly and without the careful monitoring and assessing of the environment necessary to establish a sustainable long-term adaptation on the landscape. Nevertheless, by the Classic Period several socioeconomic and sociopolitical organizational adaptations were in place reflecting the self-organization of society into a highly complex human-induced environment. The uniqueness of this evolved experiment in statecraft rests in a realization by the ancient Maya that interdependencies within and between groups as well as, in turn, within and between themselves and their environs were fundamental. This was not a frequently chosen option for the short-term, radical alterations performed by early semiarid states, as most of these attempts at self-organizing onto a landscape were interrupted or redirected by significant spikes in population concentrations (true cities) induced, in part, by precipitous surplus production often based on novel breakthroughs in technology—techno-tasking (Scarborough 2003a). Furthermore, resource concentrations were frequently challenged by other groups leading to chronic and sometimes acute warfare disruptions subverting the kinds of careful microenvironmental evaluations necessary for self-organization to mature productively.

In many ways, self-organization provides the explanatory basis for the successful and lasting interdependencies identifiable for a semitropical state. Within this context, the early state became more heterarchical than hierarchical, the latter usually associated with highly stratified, centralized urban states often associated with periods of hegemonic control. Heterarchy emphasizes the network of alliances and exchanges within a system; it is less about the rigidity of class distinctions or definitions of control. Power and control remain formidable factors in any discussion of statecraft, but in the case of the ancient Maya it is the evolving set of pathways by which information and associated goods are moved that is emphasized. This is not surprising, given the agricultural implications of the seasonal and frequently erratic rainfall from zone to adjacent zone and the perishable nature of foodstuffs in a humid setting. Highly scheduled yet flexible movements of goods and services are predictable given consumption needs, a characteristic now apparent from the number of roads identifiable in the Maya Lowlands (Shaw 2001) as well as the often cited preoccupation of the Maya with time.

During the Classic Period, the Maya developed an economic adaptation that stressed a degree of specialization at the community level. This adaptation was a self-organizing adjustment to harness the diversity in the lowlands by opting to

specialize in one or two resources produced or extracted in sizable quantities in excess of community-wide consumption. At the hamlet-, small village-, or town-level of production, these limited and specialized resources did not overextend the harvesting of forest and jungle resources. In this model, the ancient Maya coordinated the distribution and exchange of goods from several large civic centers—"cities"—positioned within a region. Socioeconomic and sociopolitical regions varied in size with time and environment, though many different goods and services were brought to these civic nodes to satisfy consumption demand by all support villagers and townspeople of a region. The huge plaza spaces noted by most Mayanists— multifunctionally designed as rainfall catchments—at the principal "cities" during the Classic Period strongly suggest the forums for necessary exchange. Control and power developed with the elite manipulation of the political economy from these socioeconomic and sociopolitical nodes. Elsewhere (Scarborough and Valdez 2003), the underlying agents supporting this system are referred to as "resource-specialized communities."

During the Late Classic Period, several authors (Martin and Grube 1995; Schele and Mathews 1998) indicate that two "super-states" occupied the heartland of the Maya Lowlands. Tikal and Calakmul have different histories, but are posited to have been the principal capitals for two competing states immediately prior to the great Maya Collapse. Flannery's (1972) brilliant article argues that precipitous collapse in the case of the Classic Maya as well as most other less dramatic terminations of the early state was a result of "hypercoherence," or that condition in which the movement of information within and between levels of class, occupational specialization, and control was so unregulated and open that chaos ensued. Although written more than a generation ago, this thoughtful perspective continues to influence interpretations of early state demise. Nevertheless, the model may well be most applicable to the trajectory of the highly centralized, hegemonic state associated with much of the Old World literature than an accurate characterization of the Maya. Elsewhere (Scarborough and Valdez 2003), it is suggested that the kind of "coherence" suggested by Flannery's model is the actual glue that held the flexible and ever-adapting Maya socioeconomic and sociopolitical system together. Although there were deliberate and highly directional communication pathways in the Maya system from the outset, network interactions could rapidly change if social or environmental conditions warranted it. Given these circumstances, the great collapse of the Classic Period Maya was then a consequence of a lack of "hypercoherence," a situation in which two huge urban centers grew to dimensions and levels of centralized control that were unwieldy for the semitropical state derived from self-organized monitoring of resources, heterarchical interdependencies, and "resource-specialized communities." Tikal and Calakmul developed in isolation from their immediate sustaining population and cultivated the hubris of their rulers. Without the constant and uninterrupted evaluation of their social and biophysical

environs undergirding their support in a highly evolved engineered landscaped, these two huge cities began the radical devolution to collapse. Rapid and flexible movements of goods and services throughout the hinterlands carried the early semitropical state forward. Isolation, excessive centralization, and elite hubris spelled its end.

CONCLUSION

This chapter has not emphasized the role of climatic change in tipping sociopolitical realignments or collapse. There is little doubt that climatic conditions have fluctuated in the recent past, though the precise magnitude of those oscillations remains subject to debate. Regardless, the fundamental organizing parameters of a society are rooted in deeply convoluted histories as well as in their adaptations to an evolving landscape, histories, and landscapes that determine the degree of social disruption wrecked by external changes. Given the environmental and social elasticity and longevity of the ancient Maya, other economic, political, and ideological variables internal to the underpinnings of society may weigh more heavily.

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